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USING BINAURAL BEATS TO ENHANCE ATTENTION

by Robert O. Sornson, Ed.S

Robert O. Sornson is the father of four children-aged two to twelve years—and has been an active member of The Monroe Institute's Professional Division since 1990. His own experience with neurological damage from pesticide poisoning led him to search out holistic interventions such as Hemi-Sync® and to obtain a degree in special education. Bob has been a teacher for twenty-four years and now serves as executive director of special education for Northville Public Schools in Northville, Michigan. He co-edited the book Teaching and Joy and regularly conducts staff and parent trainings on attention problems, individual learning differences, teaching and parenting with love and logic, and the development of learning potential in young children. Bob considers himself an innovative educator and collaborated with TMI to create On Becoming a Lifelong Learner, an album for teenage and adult students.

Abstract

This study contributes to the growing body of evidence showing that specific brain-wave states can be enhanced by listening to audiotapes embedded with tones that produce frequency-specific binaural beating. In this case, we will concern ourselves with brain-wave states that enhance the feeling of sustained comfortable attention in children. The study is designed to help us understand which specific patterns of sound, and which corresponding brain-wave states, will most effectively help children feel alert. Three different patterns or combinations of sound frequencies were used behind the musical foreground, and subjective data was collected from both parents and participants in this study. This data indicates a clear pattern of preference for one of the three sound patterns used to enhance attention.

Introduction

Attention deficit disorder (ADD), a common disorder in school age children, has uncertain, probably multiple, etiologies. It is characterized clinically by decreased attention span, impulsiveness, and—for some children—increased motor activity. Students with ADD frequently have difficulty staying on task and completing work. The broad nature of the diagnostic criteria used to define ADD has resulted in a substantially large and heterogeneous population of children being classified with this disorder. Because ADD is estimated to affect as many as 5 to 15 percent of the school-age population, such a prevalent condition may not be a "disorder" as we usually understand it, but rather a description of those individuals in our schools who have difficulty with certain forms of sustained attention. As with most children, individuals with ADD frequently show prolonged attention to television, video games, or

personally interesting tasks and therefore may reflect variations in motivation and/or other factors.

Nevertheless, there are certain truths that we may glean from recent research that apply to a large segment of the population we describe as having ADD. We know, for example, that students with attention deficit have generally lower levels of glucose metabolism as measured across the cortical areas of the brain. We also know that individuals with ADD demonstrate a general pattern of less oxygen use in the brain and that they also produce a pattern of slower brain-wave activity, with some studies specifically indicating increased theta activity in the frontal and central locations of the cortex and decreased beta activity in the posterior and temporal regions of the cortex. This research can be interpreted to indicate that many people with ADD have difficulty maintaining the high levels of brain arousal associated with sustained alertness and focused attention.

Hemi-Sync is a patented audio technology that uses binaural-beat sound impulses to alter cortical levels of arousal. Over the past forty years, a range of applications for this technology have been developed.

By using specific tones, or carefully developed combinations of tones, presented separately to each ear, binaural beats are perceived and the brain is induced to increase its own production of specific brain-wave patterns. While the Hemi-Sync technology is particularly effective at helping people achieve desired brain-wave states, there is another facet that may be just as important. Usually the right and left cortical hemispheres generate patterns of activity and brain-wave frequencies that are dissimilar. One hemisphere is often more active. There may be more theta activity in one portion of the right cortex than in the corresponding portion of the left cortex. When listening to Hemi-Sync signals, there is a sustained "synchronization" between the two hemispheres. The hemispheres of the brain must act in unison to perceive the differences in signal, increasing the level of activity between the two hemispheres and creating a balance of activity between the hemispheres and across the cortex.

This project was an effort to find the combination of sound signals that would be preferred by children diagnosed with attention deficit disorder and described as having difficulty sustaining attention. These children ranged in age from six to fourteen years old. Eighteen children, volunteered by their parents, participated in the study. These children were asked to listen to three tapes using headphones. Tape A was to be used three or more times per week for a one week period. Tape B was to be used three or more times per week for the next one-week period; then Tape C was to be used three or more times per week for the final one-week period. Parents were asked to observe any changes in the children while they were listening to a tape and engaged in an activity. Parents were also asked to do an overall assessment of which tape the child liked the best and which tape best helped their child stay focused. For each tape the parents were asked to record how many times they used the tape, any important

observations, and whether the use of this tape coincided with any changes in eating or sleeping habits. They were also asked to note and specify any changes in behavior at school, whether the child liked to use the tape, and include any other pertinent comments or observations.

Each family was given three tapes that were randomly labeled as Tape A, B, or C. The tapes were blinded to reduce the influence of expectation and possible order effects. The tapes had three variations of Hemi-Sync tones embedded behind a musical score entitled *Heart Zones*, used by permission from the composer, Doc Lew Childre, and the producer of the tapes, The Institute of HeartMath, in Boulder Creek, California. Data was then collected from each family and analyzed to determine which of the three sound patterns was preferred overall by the student listeners, to compile anecdotal, subjective information on the willingness to use the tapes, and to assess the overall effect on sustained attention and other factors.

Results

Of the eighteen families who participated in the study, seven dropped out almost immediately. Although we had discussed how to persuade children to participate consistently in this project, some children simply chose not to go along. As one parent characterized it, "Trying to get him to just listen briefly became just another thing to disagree about." When confronted with this level of resistance, I asked parents not to force the issue with their child and to discontinue participating in the study. Those who have worked with a child, or a group of children, with attention deficit disorder will understand my reasoning.

The following data was collected from the eleven families who completed the study:

Tape Preference	First, Second, or Third Week
(1) 8-16-24 Hz	Week 3
(2) No preference	
(3) 12-16 Hz	Week 2
(4) No preference	
(5) 12-16 Hz	Week 3
(6) 12-16 Hz	Week 2
(7) 12-16 Hz	Week 1
(8) 12-16 Hz	Week 3
(9) 12-16 Hz	Week 1
(10) 12-16 Hz	Week 3
(11) 12-16 Hz	Week 2

These results indicate two students with no preference, one student preferring the tape that had tones reinforcing brain-wave activity at the 8-16-24 Hz level, and eight students preferring the tape with tones reinforcing brain-wave activity at the 12 and 16 Hz level.

The two students who had no tape preference both reported improved attention during an activity, but their parents reported no significant, observable changes in behavior. The student who preferred the 8-16-24 Hz reinforcing tones happened to be a student with no hyperactivity, but it is most unlikely that this was a significant factor. The parents of the eight students who preferred the 12 and 16 Hz reinforcing tones made a variety of interesting observations.

Here are just a few of them:

"At first he didn't want to listen because it made him tired, but after listening to it, he liked the inside feeling."

"If he listens to it before school he's calmer and much easier to get along with."

"Sometimes he doesn't like to take the time to calm down."

"After a few days of nastiness, only a few minutes of this tape works wonders."

"Calm him down. Attitude changed. Was pleasant to be around. (maybe because he slept better)."

"It was a positive experience for him and seemed to have a positive effect. Matt is very impulsive and explosive and that seemed to improve."

"Mike likes Tape B the best. He uses this tape voluntarily on his own. He wants to have this one. He seems to be happier at home—much less angry. He doesn't use the tape daily anymore—but once or twice weekly."

Some of the comments about nonpreferred tapes were also interesting. One mother responded, "This tape isn't having any effect on him. He doesn't even like listening to it." This next quote is from a mother whose son preferred Tape B. She wrote, "I much prefer Tape C and if possible would really like to have a copy of Tape C as well as Tape B."

Discussion

It is clear that within our group of respondents, representing students ages six to fourteen with diagnosed attention deficit disorders, there was a strong preference for the tape with tones reinforcing 12 and 16 Hz brain-wave activity. While there were some respondents who noted positive benefits from the 8, 16, and 24 Hz tones, and one respondent who preferred that combination, absolutely no respondents preferred an 8 and 12 Hz combination. It is apparently just too slow to provide sufficient arousal for these young people to sustain comfortable attention. I surmise from the results that something about the 8-16-24 Hz combination is also less appropriate for these students. Perhaps the 8 Hz reinforcing tones add to an already over-abundant pattern of high theta and low alpha brain waves, or maybe the 24 Hz reinforcing

tones cause a slight level of discomfort or instability, which I refer to as overarousal, beyond the rate of desired cortical activity for this age range.

Based upon all these considerations, it is clear that the 12 and 16 Hz combination was preferred by students in this age range over the other combinations offered in this study. The quote that I enjoyed most came from a mother who reported, "The problem I have now is that my son and his father are arguing over who gets to use the tape when they both have something important they would like to do." These tapes are not a panacea for all the difficulties a student with attention problems may experience. However, they definitely offer one more tool that is likely to help a significant group of individuals within the ADD population to improve their sustained attention and to learn, over time, how to sustain attention on their own by adjusting their brain to an alert state.

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